that in HIGHS is characteristic of these two pressure systems.

Simultaneous kite flights made at Broken Arrow and Royal Center on the 25th afford excellent illustrations of the free-air conditions in the front sector of an advancing area of high pressure. Both records revealed the coldest air to be between the ground and an elevation slightly more than 1,000 meters. Above this the temperatures at both stations remained relatively high. At Broken Arrow the temperature at 1,755 meters (the maximum altitude) was the same as at the surface, while at Royal Center, where a considerably higher flight was obtained, the temperature at the maximum altitude, 3,665 meters, was only 6° *lower* than that at the surface. Another interesting feature of these records was a rise in the relative humidity to the saturation point *within* the inversion stratum.

TABLE 2.—*Free-air resultant winds (m. p. s.) during September, 1926*

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington D. C.[1] (34 meters)	
	Mean		9-year mean		Mean		6-year mean		Mean		9-year mean		Mean		8-year mean		Mean		9-year mean		Mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Meters																						
Surface	S. 5°E.	4.9	S.	3.3	N. 70°E.	3.3	N. 61°E.	2.7	S. 89°E.	0.7	W.	0.5	S. 8°E.	2.7	S. 18°E.	1.9	S. 20°W.	1.1	S. 45°W.	1.3	N. 14°E.	1.2
150	S. 5°E.	5.0	S.	3.5	N. 70°E.	3.4	N. 60°E.	2.7					S. 7°E.	3.5	S. 18°E.	2.5	S. 25°W.	1.4	S. 42°W.	1.5	N. 38°E.	1.1
200	S. 1°E.	7.0	S. 8°W.	4.8	N. 65°E.	3.4	N. 55°E.	2.8	S. 71°E.	1.0	S. 71°W.	0.6	S. 4°E.	4.9	S 10°E.	3.9	S 47°W.	3.1	S. 46°W.	3.2	N. 40°E.	0.8
550	S. 7°W.	7.7	S. 15°W.	5.4	N. 75°E.	4.2	N. 62°E.	3.4	S. 46°E.	1.5	S. 50°W.	1.4	S. 1°E.	6.2	S. 5°E.	4.3	S. 58°W.	3.7	S. 55°W.	4.2	N. 18°W.	1.3
7,000	S. 16°W.	8.0	S. 25°W.	5.3	N. 78°E.	4.1	N. 69°E.	3.4	S. 30°E.	1.8	S. 53°W.	2.0	S. 6°W.	7.5	S. 2°E.	4.7	S. 61°W.	4.2	S. 64°W.	4.8	N. 36°W.	3.4
1,250	S. 16°W.	7.8	S. 30°W.	5.1	N. 59°E.	3.8	N. 54°E.	3.1	S. 8°W.	3.4	S. 59°W.	2.7	S. 2°W.	8.3	S. 2°E.	4.8	S. 70°W.	5.5	S. 68°W.	5.8		
1,500	S. 21°W.	7.8	S. 39°W.	5.3	N. 58°E.	3.4	N. 56°E.	2.3	S. 20°W.	5.1	S. 66°W.	3.7	S. 3°W.	9.5	S.	4.7	S. 74°W.	7.1	S. 73°W.	6.6	N. 60°W.	5.1
1,000	S. 22°W.	7.0	S. 45°W.	5.8	N. 77°E.	6.9	N. 66°E.	2.0	S. 31°W.	6.8	S. 71°W.	4.9	S. 2°W.	8.4	S. 1°W.	4.3	S. 73°W.	10.6	S. 75°W.	8.5	N. 73°W.	5.8
2,500	S. 27°W.	6.7	S. 53°W.	5.5	N. 67°E.	5.7	N. 67°E.	1.5	S. 46°W.	8.5	S. 77°W.	6.8	S. 1°W.	7.7	S. 3°E.	4.2	S. 75°W.	15.3	S. 75°W.	10.3	N. 74°W.	6.4
2,000	S. 27°W.	7.3	S. 47°W.	6.3	N. 64°E.	2.0	S. 39°E.	0.1	S. 76°W.	12.7	S. 85°W.	9.0	S. 6°W.	7.9	S.	4.2	S. 80°W.	17.8	S. 74°W.	13.0	N. 76°W.	6.7
3,500	S. 28°W.	7.3	S. 51°W.	6.3					S. 79°W.	15.5	S. 86°W.	10.5	S. 5°W.	6.9	S. 3°W.	3.4	W.	20.5	S. 81°W.	12.3	N. 63°W.	6.9
3,000	S. 45°E.	6.9	S. 68°W.	7.3					S. 86°W.	15.1	N. 80°W.	12.1	S. 58°E.	1.5	S.	3.2	W.	20.0	W.	10.9	N. 64°W.	8.8
4,500									S 69°W.	19.6	N. 79°W.	13.2	S. 22°W.	10.0	S. 4°W.	5.4						
4,000									S. 57°W.	21.8	N. 88°W.	14.6										

[1] Naval air station.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during September, 1926*

TEMPERATURE (°C.)

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)		Due West S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Naval air station, D. C. (7 meters)
	Mean	Departure from 9-year mean	Mean	Departure from 6-year mean	Mean	Departure from 9-year mean	Mean	Departure from 5-year mean	Mean	Departure from 9-year mean	Mean
Meters											
Surface	25.3	+1.7	23.8	−0.1	12.2	−2.4	25.9	+1.3	19.5	−1.5	20.8
250	25.2	+1.8	23.5	0.0			24.8	+0.9	19.3	−1.5	19.5
500	23.1	+1.2	21.5	+0.3	12.1	−2.5	22.8	+0.4	17.9	−0.8	18.4
750	21.5	+0.9	20.5	+0.9	11.0	−3.0	21.5	+0.5	17.0	−0.2	17.3
1,000	20.3	+1.0	19.8	+1.3	10.1	−3.0	20.1	+0.3	16.1	+0.3	16.4
1,250	19.3	+1.3	18.2	+0.9	9.8	−2.4	19.0	+0.4	14.9	+0.5	15.6
1,500	18.5	+1.7	16.8	+0.8	9.1	−2.1	17.8	+0.3	14.0	+1.0	14.3
2,000	15.5	+1.3	13.6	+0.3	6.7	−2.0	15.4	+0.2	12.7	+2.2	12.7
2,500	12.4	+1.0	11.8	+1.4	4.5	−1.4	13.2	+0.5	9.8	+2.1	10.7
3,000	9.4	+0.9			1.5	−1.5	10.8	+0.5	7.7	+2.5	8.1
3,500	6.4	+1.0			−0.8	−1.0	7.9	+0.1	5.1	+2.6	5.7
4,000					−3.7	−1.2	6.0	+1.0			3.1
4,500					−6.8	−1.6	2.8	+0.6			
5,000					−10.1	−2.1					

RELATIVE HUMIDITY (%)

Surface	71	+3	76	+10	77	+9	76	0	80	+13	82
250	71	+3	76	+10			79	+3	80	+13	83
500	73	+6	77	+8	74	+7	82	+8	82	+15	81
750	75	+8	75	+5	71	+7	83	+8	82	+15	80
1,000	72	+7	76	+6	69	+7	80	+9	79	+13	78
1,250	72	+8	78	+9	63	+4	75	+7	77	+12	75
1,500	66	+5	75	+6	58	+2	71	+6	73	+10	75
2,000	62	+6	81	+15	55	+2	63	+4	65	+7	66
2,500	57	+5	69	+4	52	0	57	+4	70	+15	58
3,000	51	+2			50	−2	49	0	54	+3	53
3,500	50	−1			51	+1	56	+10	43	−3	44
4,000					45	−2	34	−8			38
4,500					57	+12	21	−19			
5,000					59	+16					

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during September, 1926*—Continued

VAPOR PRESSURE (*mb.*)

Altitude, m. s. l.	Broken Arrow, Okla. (233 meters)		Due West S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Naval air station, D. C. (7 meters)
	Mean	Departure from 9-year mean	Mean	Departure from 6-year mean	Mean	Departure from 9-year mean	Mean	Departure from 8-year mean	Mean	Departure from 9-year mean	Mean
Meters											
Surface	23.14	+3.37	22.42	+3.10	11.59	+0.18	25.34	+1.91	18.59	+1.78	20.52
250	23.01	+3.36	22.11	+3.08			24.79	+2.14	18.44	+1.83	19.31
500	21.20	+3.45	19.80	+2.56	11.07	−0.11	23.48	+2.71	17.22	+2.37	17.66
750	19.55	+3.52	18.05	+2.18	9.77	−0.40	21.37	+2.49	16.23	+2.65	16.14
1,000	17.77	+3.15	17.56	+2.77	9.07	−0.18	18.95	+2.24	14.65	+2.32	15.06
1,250	16.58	+3.13	16.66	+3.10	8.07	−0.18	16.42	+1.57	13.31	+2.17	13.66
1,500	14.30	+3.01	15.45	+2.89	6.94	−0.46	14.28	+1.19	11.95	+2.01	12.48
2,000	11.03	+2.12	13.90	+3.39	5.61	−0.40	10.83	+0.63	9.59	+1.84	9.98
2,500	8.10	+1.49	10.99	+2.46	4.69	−0.30	8.37	+0.49	8.15	+2.22	7.38
3,000	5.70	+0.80			3.92	−0.29	6.11	−0.04	5.57	+1.24	5.39
3,500	4.25	+0.28			3.47	0.00	5.55	+0.65	4.11	+1.15	3.47
4,000					2.88	+0.03	2.49	−1.28			2.50
4,500					2.85	+0.54	0.39	−2.70			
5,000					2.37	+0.58					

THE WEATHER ELEMENTS

By P. C. DAY, In Charge of Division

PRESSURE AND WINDS

Three outstanding features marked the weather of September, 1926: The abnormally heavy and frequent rains in the lower Missouri, middle Mississippi, and Ohio Valleys and some nearby localities; the severe West Indian hurricane over southern Florida and adjacent areas from the 17th to 21st; and the unusually early and

damaging cold wave over the northern plateau and thence eastward to the Great Lakes and portions of the Ohio Valley from the 23d to 26th.

Early in the month moderate cyclonic conditions developed in the central valleys, and heavy rains persisted over wide areas from the middle plains eastward to the Atlantic coast during the first week.

From the 8th to 10th a cyclone of rather unimportant dimensions moved from the middle plains to the St. Lawrence Valley, accompanied by heavy precipitation over the middle Mississippi and Ohio Valleys, some unusually heavy falls occurring in portions of Illinois and nearby areas and causing floods of serious proportions. At the same time some unusually heavy rains occurred in southwestern Arizona and elsewhere in the far Southwest.

By the 14th low pressure had overspread the central Plains, and during the following 24 to 48 hours heavy rains again prevailed over much of the territory where precipitation had been heavy a few days previously, adding further to the extent of the flood waters. At the same time unusual conditions existed and were developing in the West Indian and adjacent areas where on the morning of the 16th three distinct storms of hurricane character were in evidence. The principal one of these, attaining great severity, reached the southern Florida coast on the morning of the 18th, and disappeared over eastern Texas by the 23d. A full account of this notable storm, with details concerning loss of life and damage to property, will appear in the October REVIEW.

While no important cyclonic activity except as indicated above was noted during the latter half of the second decade, local rains occurred in the central valleys at intervals and added further to the soil moisture in sections where clear and drying weather was much needed.

At the beginning of the third decade low pressure appeared in the far Northwest, and moving into the northern Rocky Mountain region during the following day or two brought some unusually heavy and early snows. At points in eastern Washington the first snow ever observed in September occurred, and amounts up to 10 or 15 inches were measured at some of the high elevations of Idaho, Montana, and Wyoming. By the morning of the 23d this storm was central over North Dakota, and the area of precipitation extended thence southeastward to the Gulf and into many portions of the States to eastward. As this area advanced eastward, though the lowest pressure was far to the north, rains fell over wide areas, the amounts being particularly heavy in portions of the Ohio Valley and Great Lakes region.

With the passing of this rain area off the Atlantic coast low pressure was developing over the far Southwest and during the 26th and 27th some unusually heavy rains for that region occurred over central and southeastern Arizona. As this storm extended eastward it brought moderate to heavy rains over much of the southern plains, and though the low pressure soon disappeared rain persisted for several days over a considerable area from northern Texas to the middle Mississippi and Ohio Valleys, and thence northeastward.

At the close a storm of some importance had advanced into the middle Rocky Mountain area, and by the 1st of October had moved into the Dakotas and rain had fallen over wide areas, becoming heavy in portions of the upper Mississippi Valley and adjacent regions.

The only anticyclone of the month exerting an important influence on the weather entered the far Northwest on the 23d, with decidedly high pressure for the season, and advanced southeastward to the middle Mississippi Valley by the 26th, attended by freezing temperature from the plains of Washington and Oregon eastward to the Great Lakes and northern portions of Illinois and Indiana, causing much damage to unpicked fruit in the Northwest, and to the eastward to corn and other crops that had failed to mature earlier on account of continued wet and cool weather. From the central Mississippi Valley this anticyclone moved rapidly to New England, losing much of its importance as to lowering temperature, and most eastern districts escaped frost injury at that time.

The average barometric pressure was above the normal over Canada and from Montana eastward and southeastward to the Atlantic coast, and it was below over the remaining portions of the country. The changes from normal were mostly small, save considerably above in the more northeastern districts, and correspondingly low in the middle plateau.

As a rule pressure averages were higher than in August from the Rocky Mountains eastward save over Florida and the middle Gulf coast. In the northeastern districts the average pressure ranged from 0.10 to 0.15 inch higher than in August. Over all portions of Canada and the United States the pressure is normally higher in September than in August, the greatest increase ordinarily occurring in the plateau region.

The prevailing winds between the Rocky and Appalachian Mountains were mainly from southerly points; elsewhere the prevailing directions varied greatly, though chiefly from the northeast over the Atlantic coast States, and from the northwest near the Pacific coast. High winds were not extensive and damage therefrom was not great save in connection with the severe hurricane over southern Florida and adjacent areas. The details of important storms appear at the end of this section.

TEMPERATURE

For the greater part of the month temperatures were moderately high over the more southern sections and corresponding low toward the north, though the daily variations were on the whole rather small, save near the middle of the last decade when changes ranging from 20° to 30° in 24 hours occurred over wide areas in the central and northern districts from the plateau eastward.

The monthly averages were above normal over nearly the entire region from Arizona and Colorado eastward to the Atlantic coast, and it was a particularly warm month in the southern Appalachian region and adjacent portions of the east Gulf and South Atlantic States, where locally nearly every day had temperatures above normal.

Over all northern and far western States the temperature was below normal, and in Montana, Idaho, and the eastern portions of Oregon and Washington it was nearly everywhere the coldest September in 50 years or more. Over much of the far Northwest and in California it was the first month of the year with mean temperature below normal, and in Oregon it was the first month since November, 1925, with average for the entire State below normal. Over the northeastern States, where cool weather began with February, September added another month to an unusually long period of persistent coolness.

The warmer periods were during the first few days over the far Northwest, the Great Plains, Atlantic and Gulf coast States and in the Southwest, and at widely scattered dates over the remaining districts.

Maximum temperatures were slightly above 100° at some point in all southern States except Florida, reaching 117° locally in southern California, 116° in Arizona, and 110° in Texas.

The lowest temperatures were observed mainly from the 23d to 26th, although in a few northeastern and southeastern districts they occurred as early as the 13th or 14th. During the severe cold wave over northern districts from the 23d to 26th the previous records of low temperatures for September were broken nearly everywhere from the eastern portions of Oregon and Washington to the Great Lakes; and in portions of the northern Plateau and northern Rocky Mountain regions the previous minimum records for September were lowered from 5° to as much as 17°. Freezing temperatures occurred at some point in all except the Gulf and South Atlantic States, the lowest observed, −9°, occurring in Wyoming.

PRECIPITATION

September is the first month of the present year with an outstanding excess of precipitation. Probably two-thirds of the country had amounts above the normal, and over large areas in the central valleys the monthly amounts were the greatest ever measured in September and in some localities the greatest in any month. The monthly falls over much of Florida and the southern portions of Georgia, Alabama, and Mississippi were mainly far above the normal, due chiefly to heavy rains attending the passage of the West Indian hurricane over or near those districts from the 17th to 22d. Precipitation was heavy also over much of the Southwest, Arizona having the wettest September of record.

Following a rather wet August in the central valleys and some eastern districts, the nearly continuous rains of September over the greater part of the same region caused local floods of unusual proportions for that month, delayed the ripening and harvesting of crops and the preparation of the soil for fall seeding and otherwise caused large losses, the details of which appear elsewhere.

Over small areas, principally in the Carolinas and Georgia, the month was notably dry, a few places having the least precipitation of record for September. It was a dry month also in central and eastern Texas, in portions of the western plains and generally over California and some nearby States.

SNOWFALL

Considerable snow occurred over the northern Rocky Mountain region and nearby areas about the 23d and 24th, in connection with the advance of the severe cold wave into those regions. Heavy falls were reported locally in the mountains of Idaho, Montana, and Wyoming, and smaller amounts in the mountains further south and near-by foothills and Plains. In a few localities, notably in eastern Washington and northern Texas, it was the first record of snow in September.

RELATIVE HUMIDITY

The relative moisture of the atmosphere was above normal over nearly the entire eastern two-thirds of the country, the humidity percentages being far above normal over the areas having large excesses of precipitation and persistent cloudy weather. In a few far western districts the percentages were less than normal.

SEVERE LOCAL HAIL AND WIND STORMS, SEPTEMBER, 1926

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards [1]	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Shelby County, Ohio (west-central part).	1	6 p. m.			$2,300	Tornado	Some crop and property damage	Official, U. S. Weather Bureau.
Taylor County, Tex.	1	8 p. m.				Hail	About 10 per cent crop damage	Do.
Pueblo, Colo.	2	4 p. m.				Whirlwind	A large coal shed wrecked and another moved 500 feet away.	Do.
Webster County, Nebr. (central part of).	2	4 p. m.	440		1,300	Hail	Severe damage over path 5 miles long	Do.
Krider, Nebr.	2	5 p. m.	220		50,000	Tornado and hail	Buildings on several farms wrecked; large trees uprooted; crops badly damaged by hail; 2 persons injured.	Do.
Nemaha County, Kans., in to southern Pawnee County, Nebr.	2	6 p. m.	440		100,000	Tornado	All buildings on several farms completely demolished, on other farms damaged; some livestock killed; crops damaged; several persons injured.	Do.
Sumner, Ill. (near)	2	9 p. m.		1	900	Thunderstorm and rain.	Some damage to crops and other property; a boy killed near Beardstown.	Do.
Taylor County, Iowa	2	9 p. m.				Hail and wind	Crop damage about 25 per cent	Do.
Stratton, Nebr.	3	1.50 a. m.	3 mi.		60,000	Hail	Crops severely damaged; some property damage over path 8 miles long.	Do.
Carlinville, Ill.	3	6:30 p. m.		1		Wind	Tents blown over; minor property damage; 2 persons injured.	Do.
Lincoln, Ill. (south of)	4	5 p. m.			2,500	do	Small buildings damaged over narrow path 5 miles long. Slight crop injury.	Do.
Colorado Springs, Colo.	4	P. m.				Whirlwind and hail.	Trees uprooted; tents and fences blown down; cottages damaged.	Do.
Hardin County, Ohio	4	P. m.			50,000	Tornado	Five large barns demolished; one person severely injured.	Do.
Cimarron County, Okla.	4	3-4.30 p.m.	880			Hail	Considerable crop damage over path 45 miles long.	Do.
Owensboro, Ky., and vicinity	5	P. m.				Wind, rain, and electrical.	Some damage by lightning; trees broken; some electric power trouble.	Inquirer (Owensboro, Ky.)
Harrisburg, Pa.	6					Thunderstorm, rain, and wind.	Much fruit blown from trees; many branches broken.	Official U. S. Weather Bureau.
Furnas County, Nebr. (east part of).	7	6 p. m.	3,520		4,000	Hail and wind	A number of windmills and farm buildings wrecked; trees uprooted; crop damaged.	Do.
Grand Island, Nebr.	7	8.30 p. m.	10 mi.		100	Hail	Slight crop damage; some windows broken	Do.
Hancock County, Iowa	7	10.30 p. m.				Tornado	Several buildings blown down	Do.
Kossuth, Winnebago, and Cerro Gordo Counties, Iowa.	7	11 p. m.				Wind	Several buildings blown down in each county	Do.
Yuma, Ariz.	7					Wind and rain	Buildings and irrigation canals damaged; paving undermined; section of railway track washed out.	Do.
Harrison County, Iowa	8	2 a. m.				Hail	Orchards injured	Do.

[1] "Mi." signifies miles instead of yards.